

6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of
9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

1 63. The program product of claim 62 wherein said cluster servicer can send a cluster
2 message to a destination computer with a plurality of adapters by determining an alternate
3 Internet address for said destination computer with a plurality of adapters from said cluster
4 destination address table corresponding to said destination computer with a plurality of
5 adapters, when a timely response from said destination computer with a plurality of
6 adapters is not received after sending a cluster message addressed to said primary Internet
7 address for said destination computer with a plurality of adapters.

Remarks

The present application discloses an enhanced cluster messaging system that performs cluster messaging without an intervening dedicated LAN.

Reconsideration of the application, as amended, is requested. Claims 7, 14, 28, 45 and 54 have been amended. Claims 1-63 remain in this application.

The Examiner rejected claims 1-63 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-56 of parent application 09/280,469, now U.S. Patent 6,192,417. The Examiner acknowledged that a timely-filed terminal disclaimer would overcome this rejection. Applicants submit herewith a terminal disclaimer that overcomes the double patenting rejection.

In section I of the Office Action, the Examiner rejects claims 1-6 and 37-44 (Group A), claims 7-13 and 45-53 (Group B), claims 14-21 and 54-63 (Group C), and

claims 22-29 and 31-35 (Group D) under 35 U.S.C. §102(b) as being anticipated by Attanasio et al. (US Patent 5,371,852), hereinafter Attanasio. Applicants respectfully traverse this rejection as it pertains to the claims of Groups A, and D, and have amended the claims of Groups B and C to overcome this rejection.

As mentioned, the Examiner has grouped the claims into four groups for the purposes of his Office Action. Applicants respond below using the same groupings.

Group A

Independent claims 1 and 37 each call for a cluster servicer that facilitates cluster messaging within a cluster without requiring an intervening dedicated local area network. Cluster messaging is well known in the art to refer to message passing within a cluster for the purpose of performing certain management functions that are important to the cluster. Applicants' use of this term is consistent with its use in the industry. Consider, for example, page 2, lines 16-19 of Applicants' specification. "These applications relay cluster messages back and forth across the cluster network to control cluster activities. For instance, each computer system in a cluster continuously monitors each of the other computer systems in the same cluster to ensure that each is alive and performing the processing assigned to it." A critical point here, then, is the fact that Applicants' claim pertains to messages that are passed amongst computer systems that are members of the same cluster. Thus, the present invention permits nodes to participate in the same cluster without the need for a dedicated LAN. It is important to distinguish this capability from the standard scenario of a non-cluster computer using the cluster as a computing resource.

Attanasio, while an important addition to the art, does not disclose cluster messaging between nodes of a cluster without the use of a dedicated intervening LAN. Instead, Attanasio discloses communication between a separate computer (called a Host) and a cluster. In the context of the Examiner's rejection, Attanasio simply discloses the typical cluster/computer scenario in which a non-cluster computer uses the cluster as a

computing resource. Said yet another way, Attanasio discloses computer to cluster communication, not cluster node to cluster node communication. Indeed, review of Attanasio makes this point clear. Please consider column 6, lines 65-68 of Attanasio.

The encapsulated cluster 200 connects 127 to a high speed communication link 120, here called a network. Host computers 130, also connected to the network 120, communicate with the encapsulated cluster 200, and the nodes (105 through 109) within the cluster, over the network. ... A host computer could also be an encapsulated cluster of computers 200, i.e., the present invention, which gives a single system image to the network.

Please also consider column 11, lines 16-20.

Note that every incoming message addresses only the gateway of the cluster. This gives the cluster the appearance of a single computer to the network, even though the incoming messages can be routed to any of the nodes in the cluster.

As stated in these passages of Attanasio, the encapsulated cluster, which is connected to the network via a gateway, gives a single system image to the network. The Host, which is also connected to the network, is the beneficiary of the single system image provided by the cluster, not a member of the cluster. As a side note, the fact that the Attanasio inventors state that a Host computer could also be an encapsulated cluster does not mean that the Host is a member of a cluster. This instead means that the Host itself could be a cluster, meaning that two clusters would be involved.

Applicants respectfully submit, then, that independent claims 1 and 37, and the dependent claims thereto, are not anticipated by Attanasio under 35 U.S.C. § 102.

Dependent Claims of Group A

Applicants respectfully submit that the dependent claims of Group A are patentable in that they depend from patentable independent claims 1 and 37. However, in the interests of cooperation, Applicants respond below to certain of the Examiner's arguments relative to these dependent claims. It should be noted, though, that the lack of an explicit discussion regarding each of the Examiner's points should not be taken to imply agreement or acquiescence on the part of Applicants.

As to claims 2 and 40, Attanasio does not disclose routing of internal messages within the cluster to hosts outside the cluster. The passage of Attanasio relied upon by the Examiner (column 10, lines 62-67 and column 11, lines 45) refers only to sharing of a TCP port, and potentially, communication with an external Host. There is simply no discussion of transmitting internal cluster messages outside of the cluster. Therefore, Applicants respectfully submit that claims 2 and 40 are not anticipated by Attanasio under 35 U.S.C. § 102.

As to claims 3 and 41, Attanasio does not disclose an Internet Protocol routing at least one formatted cluster message to a system outside the cluster without requiring a dedicated LAN. The fact that Attanasio may disclose the use of IP for "configuring cluster messages" does not add up to use of IP routing for cluster messages to nodes that are not connected via a dedicated LAN.

Groups B and C

Independent claims 7, 14, 45 and 54 have been amended to better point out that cluster messages are passed to other nodes in the cluster without requiring an intervening dedicated LAN, which as discussed above, is not disclosed by Attanasio. Therefore, the claims of Groups B and C are seen by Applicants as allowable over Attanasio under 35 U.S.C. § 102.

Group D

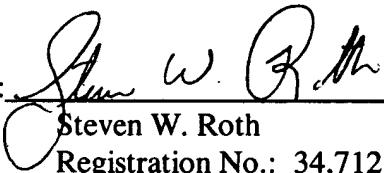
Independent claim 22 calls for use of a network address for cluster communications beyond a single local area network. Independent claim 31 calls for communicating between computers in said cluster without requiring an intervening dedicated local area network. Thus, both independent claims make clear that cluster messaging takes place with nodes that are not connected via a dedicated LAN. For the reasons set forth above with respect to the claims of Group A, Applicants submit that the claims of Group D are not anticipated by Attanasio under 35 U.S.C. § 102.

In section II of the Office Action, the Examiner rejects claims 30 and 36 under 35 U.S.C. §103(a) as being unpatentable over Attanasio et al. (US Patent 5,371,852), hereinafter Attanasio, and the knowledge and skill of the ordinary person in the art. Applicants respectfully traverse this rejection. Claims 30 and 36 respectively depend from independent claims 22 and 31, and thus, are seen as patentable for the reasons set forth in the discussion of the claims of Group D above.

PATENT
AMENDMENT

In view of the above amendments and remarks, Applicants submit that this application is in condition for allowance and respectfully request reconsideration and withdrawal of the outstanding rejections and/or objections. Allowance of all claims remaining in this application is respectfully requested. The Examiner is urged to call the undersigned at the below-listed telephone number if, in the Examiner's opinion, such a phone conference would expedite or aid in the prosecution of this application.

Respectfully submitted,

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Version with Markings to Show Changes Made

In the Claims:

Claims 7, 14, 28, 45, and 54 have been amended as follows:

1 1. An apparatus comprising:

2 at least one processor;

3 a memory coupled to at least one processor;

4 a cluster servicer residing in said memory, said cluster servicer facilitating cluster
5 messaging with at least one other computer without requiring an intervening
6 dedicated local area network to said at least one other computer.

1 2. The apparatus of claim 1 further comprising a network message servicer residing in
2 said memory, said network message servicer routing at least one cluster message from said
3 cluster servicer to said at least one other computer.

1 3. The apparatus of claim 2 wherein said network message servicer comprises:

2 a User Datagram Protocol, said User Datagram Protocol formatting said at least
3 one cluster message to be sent to said at least one other computer;

4 an Internet Protocol, said Internet Protocol routing said at least one formatted
5 cluster message to said at least one other computer without requiring an
6 intervening dedicated local area network to said at least one other computer.

1 4. The apparatus of claim 2 wherein said cluster servicer includes a cluster destination
2 address table, said cluster destination address table comprising at least one network
3 address for said at least one other computer, and wherein said cluster servicer retrieves
4 said at least one network address for said at least one other computer from said cluster
5 destination address table to facilitate cluster messaging with said at least one other
6 computer without requiring an intervening dedicated local area network to said at least
7 one other computer.

1 5. The apparatus of claim 4 wherein said cluster destination address table further
2 comprises cluster status information for said at least one other computer.

1 6. The apparatus of claim 4 wherein said cluster destination address table further
2 comprises adapter information for said at least one other computer.

1 7. An apparatus comprising:

2 at least one processor;

3 a memory coupled to at least one processor;

4 a network message servicer residing in said memory; and

5 a cluster servicer residing in said memory, said cluster servicer including a cluster
6 destination address table, said cluster destination address table including at least
7 one address for at least one other apparatus networked to said apparatus, wherein
8 a message to one of said at least one other apparatus can be sent by said cluster
9 servicer retrieving said at least one address for said at least one other apparatus
10 from said cluster destination address table and passing said retrieved address and
11 said message to said network servicer, wherein said network servicer routes said

12 message to said at least one other apparatus without requiring an intervening
13 dedicated local area network to said at least one other apparatus.

1 8. The apparatus of claim 7 wherein said cluster destination address table further
2 comprises adapter information for each of said at least one address for at least one other
3 apparatus networked to said apparatus.

1 9. The apparatus of claim 7 wherein said cluster destination address table further
2 comprises status information for each of said at least one address for at least one other
3 apparatus networked to said apparatus.

1 10. The apparatus of claim 7 operating as a computer cluster, said computer cluster
2 comprising at least one other apparatus networked to said apparatus, wherein each
3 apparatus in said computer cluster comprises:

4 at least one processor;

5 a memory coupled to at least one processor;

6 a User Datagram Protocol residing in said memory, said User Datagram Protocol
7 formatting at least one packet to be sent between apparatuses in said computer
8 cluster;

9 an Internet Protocol residing in said memory, said Internet Protocol routing said at
10 least one packet between apparatuses in said computer cluster; and

11 a cluster servicer residing in said memory, said cluster servicer including a cluster
12 destination address table, said cluster destination address table including at least
13 one Internet address for said each apparatus in said computer cluster, wherein a
14 message can be sent to one of said each apparatus in said computer cluster by said

15 cluster servicer determining one of said at least one Internet address of said one of
16 said each apparatus in said computer cluster from said cluster destination address
17 table and passing said determined Internet address and said message to said User
18 Datagram Protocol, wherein said User Datagram Protocol formats said determined
19 Internet address and said message into at least one packet and passes said at least
20 one packet to said Internet Protocol, wherein said Internet Protocol routes said at
21 least one packet to said one of said each apparatus in said computer cluster.

1 11. The apparatus of claim 7 wherein said cluster destination address table includes at
2 least one Internet address for said at least one other apparatus networked to said
3 apparatus, and wherein a message to one of said at least one other apparatus can be sent
4 by said cluster servicer retrieving said at least one Internet address for said at least one
5 other apparatus from said cluster destination address table and passing said retrieved
6 Internet address and said message to said network servicer.

1 12. The apparatus of claim 11 wherein said network message servicer comprises:

2 a User Datagram Protocol which formats at least one packet from said message
3 and said retrieved Internet address; and
4 an Internet Protocol, said Internet protocol routing said at least one packet to said
5 one of said at least one other apparatus networked to said apparatus.

1 13. The apparatus of claim 12 wherein said at least one other apparatus networked to
2 said apparatus is networked through a plurality of routers, and wherein said Internet
3 Protocol comprises specific routing directions indicating which router of said plurality of
4 routers should be used for routing said at least one packet to said at least one other
5 apparatus.

- 1 14. A cluster of computers, each computer in said cluster of computers comprising:
 - 2 at least one processor;
 - 3 at least one network adapter;
 - 4 a memory coupled to said at least one processor;
 - 5 a User Datagram Protocol residing in said memory, said User Datagram Protocol
 - 6 formatting at least one packet to be sent between computers in said cluster of
 - 7 computers;
- 8 an Internet Protocol suite residing in said memory, said Internet Protocol routing
- 9 said at least one packet between computers in said cluster of computers; and
- 10 a cluster servicer residing in said memory, said cluster servicer including a cluster
- 11 destination address table, said cluster destination address table including a cluster
- 12 destination address table entry for each computer in said cluster of computers, said
- 13 each cluster destination address table entry comprising:
 - 14 an Internet address for each of said at least one network adapter;
 - 15 status information for each of said at least one network adapter; and
 - 16 adapter information for each of said at least one network adapter;
- 17 wherein said cluster servicer sends a cluster message to a destination computer in said
- 18 cluster of computers by determining an Internet address for said destination computer
- 19 from said cluster destination address table entry for said destination computer and passing

20 said determined Internet address of said destination computer and said cluster message to
21 said User Datagram Protocol, wherein said User Datagram Protocol formats said
22 determined Internet address and said cluster message into a packet and passes said packet
23 to said Internet Protocol, wherein said Internet Protocol routes said packet to said
24 destination computer, said Internet Protocol routing said packet to said destination
25 computer without requiring an intervening dedicated local area network to said destination
26 computer.

1 15. The cluster of computers of claim 14 wherein said Internet Protocol on said each
2 computer in said cluster of computers includes a routing table, said routing table including
3 at least one routing table entry, said at least one routing table entry including a subnet
4 address and corresponding routing direction for said subnet address, and wherein at least
5 one additional routing table entry exists in said routing table for each computer in said
6 cluster of computers that is attached to a plurality of routers, said at least one additional
7 routing table entry including a subnet address and corresponding routing direction for said
8 subnet address that specifies to which router of said plurality of routers to route said at
9 least one packet.

1 16. The cluster of computers of claim 14 wherein said cluster servicer in each
2 computer in said cluster of computers can employ said cluster destination address table,
3 said User Datagram Protocol, and said Internet Protocol to route all cluster messages
4 necessary to maintain said cluster of computers.

1 17. The cluster of computers of claim 14 wherein said cluster servicer can determine
2 from said status information in said cluster destination address table whether a network
3 adapter for one of said each computer in said cluster of computers is reachable or
4 unreachable.

1 18. The cluster of computers of claim 14 wherein said cluster servicer can determine
2 from said adapter information in said cluster destination address table how to assign
3 cluster responsibilities to said each computer in said cluster of computers.

1 19. The cluster of computers of claim 14 wherein said cluster servicer can determine
2 from said adapter information in said cluster destination address table how to size cluster
3 messages to each network adapter on said each computer in said cluster of computers.

1 20. The cluster of computers of claim 14 wherein at least one computer in said cluster
2 of computers has a plurality of network adapters, and wherein each cluster destination
3 address table entry corresponding to said at least one computer in said cluster of
4 computers with a plurality of network adapters includes an Internet address for each of
5 said plurality of network adapters, said plurality of Internet addresses ordered
6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of
9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

1 21. The cluster of computers of claim 20 wherein said cluster servicer can send a
2 cluster message to a destination computer with a plurality of adapters by determining an
3 alternate Internet address for said destination computer with a plurality of adapters from
4 said cluster destination address table corresponding to said destination computer with a
5 plurality of adapters, when a timely response from said destination computer with a
6 plurality of adapters is not received after sending a cluster message addressed to said
7 primary Internet address for said destination computer with a plurality of adapters.

1 22. A method comprising the steps of:

2 creating network address information for each computer in a cluster configuration;

3 storing said network address information on said each computer in said cluster
4 configuration; and

5 employing said network address information in conjunction with a network
6 message servicer for cluster communications in said cluster configuration beyond a
7 single local area network.

1 23. The method of claim 22 further comprising the steps of:

2 creating routing information for each computer connected to a plurality of routers
3 in said cluster configuration, said routing information identifying which router of
4 said plurality of routers to employ in communicating between said each computer
5 connected to said plurality of routers in said cluster configuration; and

6 storing said routing information on each said computer connected to said plurality
7 of routers in said cluster configuration.

1 24. The method of claim 22 wherein the step of creating network address information
2 for said each computer in said cluster configuration comprises the step of creating a
3 cluster destination address table on said each computer in said cluster configuration,
4 wherein the step of creating said cluster destination address table comprises creating a
5 cluster destination address table entry for said each computer in said cluster configuration,
6 said cluster destination address table entry including at least one network address for a
7 computer in said cluster configuration corresponding to said cluster destination address
8 table entry.

1 25. The method of claim 24 wherein the step of employing said network address
2 information in conjunction with a network message servicer for cluster communications in
3 said cluster configuration beyond a single local area network comprises the steps of:

4 retrieving said at least one network address from at least one cluster destination
5 address table entry corresponding to at least one computer in said cluster
6 configuration;

7 employing said network message servicer to send at least one cluster message to
8 said at least one computer in said cluster configuration by passing said retrieved at
9 least one network address for said at least one computer in said cluster
10 configuration along with said at least one cluster message to a network message
11 servicer, said network message servicer routing said at least one cluster message to
12 said at least one computer in said cluster configuration using said retrieved at least
13 one network address.

1 26. The method of claim 25 wherein the step of employing said network message
2 servicer to send at least one cluster message to said at least one computer in said cluster
3 configuration comprises the step of passing said retrieved at least one network address for
4 said at least one computer in said cluster configuration along with said at least one cluster
5 message to a User Datagram Protocol, said User Datagram Protocol formatting said
6 retrieved at least one network address for said at least one computer in said cluster
7 configuration and said at least one cluster message into at least one packet, said User
8 Datagram Protocol passing said at least one packet to an Internet Protocol, said Internet
9 Protocol routing said at least one packet to said at least one computer in said cluster
10 configuration.

1 27. The method of claim 24 wherein the step of creating a cluster destination address
2 table for said each computer in said cluster configuration comprises the step of creating a
3 cluster destination address table entry for said each computer in said cluster configuration,
4 said cluster destination address table entry including a primary network address and at
5 least one alternate network address for said computer in said cluster configuration
6 corresponding to said cluster destination address table entry.

1 28. (Amended) The method of claim 27 wherein the step of employing said network
2 address information in conjunction with a network message servicer for cluster
3 communications in said cluster configuration beyond a single local area network comprises
4 the steps of:

5 retrieving at least one network address from at least one cluster destination address
6 table entry corresponding to at least one computer in said cluster configuration;

7 employing said network message servicer to send at least one cluster message to
8 said at least one computer in said cluster configuration by passing said primary
9 network address for said at least one computer in said cluster configuration along
10 with said at least one cluster message to a network message servicer, said network
11 message servicer routing said at least one cluster message to said at least one
12 computer in said cluster configuration using said primary network address;

13 awaiting a reply to said at least one cluster message sent to said at least one
14 computer in said cluster configuration using said primary network address; and

15 employing said network message servicer to send at least one cluster message to
16 said at least one computer in said cluster configuration by passing said at least one
17 alternate network address for said at least one computer in said cluster
18 configuration along with said at least one cluster message to a network message
19 servicer, said network message servicer routing said at least one cluster message to
20 said at least one computer in said cluster configuration using said at least one
21 alternate network address, when said reply to said at least one cluster message sent
22 to said at least one computer in said cluster configuration using said primary
23 network address is not received in a timely manner.

1 29. The method of claim 22 wherein the step of storing said network address
2 information on said each computer in said cluster configuration comprises the step of
3 storing a copy of said network address information on a first computer in said cluster
4 configuration, said first computer updating said network address information with adapter
5 information about said first computer; said first computer sending a copy of updated
6 network address information to each other computer in said cluster configuration; said
7 each other computer in said cluster configuration updating said network address
8 information with adapter information about said each other computer in said cluster
9 configuration; said each computer in said cluster configuration exchanging said updated
10 network address information such that said each computer in said cluster configuration
11 receives an identical copy of said updated network address information .

1 30. The method of claim 29 wherein the steps of:
2
3 updating said network address information about said first computer comprises the
4 step of updating said network address information with adapter type, maximum
transmission unit, subnet mask, and class of service for said first computer; and
5
6 updating said network address information about said each other computer in said
7 cluster configuration comprises the step of updating said network address
information with adapter type, maximum transmission unit, subnet mask, and class
8 of service for each other computer in said cluster configuration.

1 31. A method of communicating between computers in a cluster comprising the steps
2 of:
3
4 creating a cluster destination address table on said each computer in said cluster,
5 said cluster destination address table including a cluster destination address table
entry for said each computer in said cluster, said cluster destination address table
6 entry including a primary network address and at least one alternate network

7 address for said computer in said cluster corresponding to said cluster destination
8 address table entry;

9 storing said cluster destination address table on said each computer in said cluster;
10 and

11 employing said cluster destination address table in conjunction with a network
12 message servicer for communicating between computers in said cluster without
13 requiring an intervening dedicated local area network.

1 32. The method of claim 31 further comprising the steps of:

2 adding routing information to said network message servicer for each computer
3 connected to a plurality of routers in said cluster, said routing information
4 identifying which router of said plurality of routers to employ in communicating
5 between said each computer connected to said plurality of routers in said cluster.

1 33. The method of claim 31 wherein the step of employing said cluster destination
2 address table in conjunction with a network message servicer for communicating between
3 computers in said cluster without requiring an intervening dedicated local area network
4 comprises the steps of:

5 retrieving at least one primary network address from at least one cluster
6 destination address table entry corresponding to at least one computer in said
7 cluster; and

8 employing said network message servicer to communicate with at least one
9 computer in said cluster by passing said retrieved at least one primary network
10 address for said at least one computer in said cluster along with at least one cluster
11 message to said network message servicer, said network message servicer routing

12 said at least one cluster message to said at least one computer in said using said
13 retrieved at least one primary network address.

1 34. The method of claim 33 wherein the step of employing said network message
2 servicer to communicate with at least one computer in said cluster comprises the step of
3 passing said retrieved at least one primary network address for said at least one computer
4 in said cluster along with at least one cluster message to a User Datagram Protocol, said
5 User Datagram Protocol formatting said retrieved at least one primary network address
6 for said at least one computer in said cluster and said at least one cluster message into at
7 least one packet, said User Datagram Protocol passing said at least one packet to an
8 Internet Protocol, said Internet Protocol routing said at least one packet to said at least
9 one computer in said cluster.

1 35. The method of claim 31 wherein the step of storing said cluster destination address
2 table on said each computer in said cluster comprises the step of storing a copy of said
3 cluster destination address table on a first computer in said cluster, said first computer
4 updating said cluster destination address table with adapter information about said first
5 computer; said first computer sending a copy of an updated cluster destination address
6 table to each other computer in said cluster; said each other computer in said cluster
7 updating said cluster destination address table with adapter information about said each
8 other computer in said cluster; said each computer in said cluster exchanging said updated
9 cluster destination address table such that said each computer in said cluster receives an
10 identical copy of said updated cluster destination address table.

1 36. The method of claim 35 wherein the steps of:

2 updating said cluster destination address table with adapter information about said
3 first computer comprises the step of updating said cluster destination address table
4 with adapter type, maximum transmission unit, subnet mask, and class of service

5 for each said primary network address and said each at least one alternate network
6 address for said first computer; and

7 updating said cluster destination address table with adapter information about said
8 each other computer in said cluster comprises the step of updating said cluster
9 destination address table with adapter type, maximum transmission unit, subnet
10 mask, and class of service for each said primary network address and said each at
11 least one alternate network address for said each other computer in said cluster.

1 37. A program product comprising:

2 (A) a cluster servicer, said cluster servicer facilitating cluster messaging with at
3 least one other computer without requiring an intervening dedicated local area
4 network to said at least one other computer; and

5 (B) signal bearing media bearing said cluster servicer.

1 38. The program product of claim 37 wherein said signal bearing media comprises
2 transmission media.

1 39. The program product of claim 37 wherein said signal bearing media comprises
2 recordable media.

1 40. The program product of claim 37 further comprising a network message servicer,
2 said network message servicer routing at least one cluster message from said cluster
3 servicer to said at least one other computer.

1 41. The program product of claim 40 wherein said network message servicer
2 comprises:

3 a User Datagram Protocol, said User Datagram Protocol formatting said at least
4 one cluster message to be sent to said at least one other computer;

5 an Internet Protocol, said Internet Protocol routing said at least one formatted
6 cluster message to said at least one other computer without requiring an
7 intervening dedicated local area network to said at least one other computer.

1 42. The program product of claim 40 wherein said cluster servicer includes a cluster
2 destination address table, said cluster destination address table comprising at least one
3 network address for said at least one other computer, and wherein said cluster servicer
4 retrieves said at least one network address for said at least one other computer from said
5 cluster destination address table to facilitate cluster messaging with said at least one other
6 computer without requiring an intervening dedicated local area network to said at least
7 one other computer.

1 43. The program product of claim 42 wherein said cluster destination address table
2 further comprises cluster status information for said at least one other computer.

1 44. The program product of claim 42 wherein said cluster destination address table
2 further comprises adapter information for said at least one other computer.

1 45. A program product comprising:

2 (A) a network message servicer;

3 (B) a cluster servicer, said cluster servicer including a cluster destination address
4 table, said cluster destination address table including at least one address for each
5 of a plurality of apparatuses in a computer cluster, wherein a message to one of
6 said plurality of apparatuses can be sent by said cluster servicer retrieving one of
7 said at least one address for said one of said plurality of apparatuses from said

8 cluster destination address table and passing said retrieved address and said
9 message to said network servicer, wherein said network servicer routes said
10 message to said one of said plurality of apparatuses without requiring an
11 intervening dedicated local area network to said one of said plurality of
12 apparatuses; and
13 (C) signal bearing media bearing said network message servicer and said cluster
14 servicer.

1 46. The program product of claim 45 wherein said signal bearing media comprises
2 transmission media.

1 47. The program product of claim 45 wherein said signal bearing media comprises
2 recordable media.

1 48. The program product of claim 45 wherein said cluster destination address table
2 further comprises adapter information for said each of said plurality of apparatuses.

1 49. The program product of claim 45 wherein said cluster destination address table
2 further comprises status information for said each of said plurality of apparatuses.

1 50. The program product of claim comprising:
2 a User Datagram Protocol, said User Datagram Protocol formatting at least one
3 packet to be sent between said plurality of apparatuses in said computer cluster;
4 an Internet Protocol, said Internet Protocol routing said at least one packet
5 between said plurality of apparatuses in said computer cluster; and
6 a cluster servicer, said cluster servicer including a cluster destination address table,
7 said cluster destination address table including at least one Internet address for

8 each of said plurality of apparatuses in said computer cluster, wherein a message
9 can be sent to one of said plurality of apparatuses in said computer cluster by said
10 cluster servicer determining one of said at least one Internet address for said one of
11 said plurality of apparatuses in said computer cluster from said cluster destination
12 address table and passing said determined Internet address and said message to
13 said User Datagram Protocol, wherein said User Datagram Protocol formats said
14 determined Internet address and said message into at least one packet and passes
15 said at least one packet to said Internet Protocol, wherein said Internet Protocol
16 routes said at least one packet to said one of said plurality of apparatuses in said
17 computer cluster.

1 51. The program product of claim 45 wherein said cluster destination address table
2 includes at least one Internet address for said each of said plurality of apparatuses in said
3 computer cluster, and wherein a message to one of said plurality of apparatuses can be
4 sent by said cluster servicer retrieving one of said at least one Internet address for said one
5 of said plurality of apparatuses from said cluster destination address table and passing said
6 retrieved Internet address and said message to said network servicer.

1 52. The program product of claim 51 wherein said network message servicer
2 comprises:

3 a User Datagram Protocol which formats at least one packet from said message
4 and said retrieved Internet address; and

5 an Internet Protocol, said Internet protocol routing said at least one packet to said
6 one of said plurality of apparatuses networked to said apparatus.

1 53. The program product of claim 52 wherein said at least two of said plurality of
2 apparatuses in said computer cluster are networked through a plurality of routers, and
3 wherein said Internet Protocol comprises specific routing directions indicating which

4 router of said plurality of routers should be used for routing said at least one packet
5 between said two of said plurality of apparatuses in said computer cluster networked
6 together through a plurality of routers.

1 54. A program product comprising:

2 a User Datagram Protocol, said User Datagram Protocol formatting at least one
3 packet to be sent between computers in a cluster of computers;

4 an Internet Protocol suite, said Internet Protocol routing said at least one packet
5 between computers in said cluster of computers; and

6 a cluster servicer, said cluster servicer including a cluster destination address table,
7 said cluster destination address table including a cluster destination address table
8 entry for each computer in said cluster of computers, said each cluster destination
9 address table entry comprising:

10 an Internet address for each network adapter;

11 status information for said each network adapter; and
12 adapter information for said each network adapter;

13 wherein said cluster servicer sends a cluster message to a destination computer in said
14 cluster of computers by determining an Internet address for said destination computer
15 from said cluster destination address table entry for said destination computer and passing
16 said determined Internet address of said destination computer and said cluster message to
17 said User Datagram Protocol, wherein said User Datagram Protocol formats said
18 determined Internet address and said cluster message into a packet and passes said packet
19 to said Internet Protocol, wherein said Internet Protocol routes said packet to said

20 destination computer without requiring an intervening dedicated local area network to said
21 destination computer.

1 55. The program product of claim 54 wherein said signal bearing media comprises
2 transmission media.

1 56. The program product of claim 54 wherein said signal bearing media comprises
2 recordable media.

1 57. The program product of claim 54 wherein said Internet Protocol includes a routing
2 table, said routing table including at least one routing table entry, said at least one routing
3 table entry including a subnet address and corresponding routing direction for said subnet
4 address, and wherein at least one additional routing table entry exists in said routing table
5 for each computer in said cluster of computers that is attached to a plurality of routers,
6 said at least one additional routing table entry including a subnet address and
7 corresponding routing direction for said subnet address that specifies to which router of
8 said plurality of routers to route said at least one packet.

1 58. The program product of claim 54 wherein said cluster servicer can employ said
2 cluster destination address table, said User Datagram Protocol, and said Internet Protocol
3 to route all cluster messages necessary to maintain said cluster of computers.

1 59. The program product of claim 54 wherein said cluster servicer can determine from
2 said status information in said cluster destination address table whether a network adapter
3 for one of said each computer in said cluster of computers is reachable or unreachable.

1 60. The program product of claim 54 wherein said cluster servicer can determine from
2 said adapter information in said cluster destination address table how to assign cluster
3 responsibilities to said each computer in said cluster of computers.

- 1 61. The program product of claim 54 wherein said cluster servicer can determine from
2 said adapter information in said cluster destination address table how to size cluster
3 messages to each network adapter on said each computer in said cluster of computers.

- 1 62. The program product of claim 54 wherein at least one computer in said cluster of
2 computers has a plurality of network adapters, and wherein each cluster destination
3 address table entry corresponding to said at least one computer in said cluster of
4 computers with a plurality of network adapters includes an Internet address for each of
5 said plurality of network adapters, said plurality of Internet addresses ordered
6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of
9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

- 1 63. The program product of claim 62 wherein said cluster servicer can send a cluster
2 message to a destination computer with a plurality of adapters by determining an alternate
3 Internet address for said destination computer with a plurality of adapters from said cluster
4 destination address table corresponding to said destination computer with a plurality of
5 adapters, when a timely response from said destination computer with a plurality of
6 adapters is not received after sending a cluster message addressed to said primary Internet
7 address for said destination computer with a plurality of adapters.